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09/818,498	03/28/2001	Nobuaki Usui	1075.1155	1215

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EXAMINER	
LEE, TOMMY D	

ART UNIT	PAPER NUMBER
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/818,498	USUI ET AL.	
	Examiner	Art Unit	
	Thomas D. Lee	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,16,17,20-27 and 32-40* is/are rejected.

7)☒ Claim(s) *14,15,18,19 and 28-31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *21 July 2005*.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action is responsive to applicant's amendment filed May 16, 2005. Claims 1-40 are pending.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 2, 7-11, 16, 17, 32-35 and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,107,346 (Bowers et al.).

Regarding claims 1, 2 and 7, Bowers et al. disclose a halftoning method of converting a multilevel input image into a binary image, comprising the steps of: (a) calculating the multilevel value of a given noteworthy pixel of the multilevel input image, as an estimated value of the noteworthy pixel based on the multilevel values of pixels other than the noteworthy pixel (Gray level to be quantized based on a weighted quantization error, which is obtained from previously quantized pixels (column 7, line 67 – column 8, line 18). Errors are based on comparison of prior multilevel pixels and a threshold value, and thus estimated value of noteworthy pixel based, at least indirectly, on multilevel values of prior pixels); and converting the estimated multilevel value of the noteworthy pixel into a binary value (column 6, lines 46-60; column 8, lines 36-43). In said calculating step (a), the estimated value of the noteworthy pixel is calculated based on the multilevel values of pixels in a predetermined area that is a predetermined distance apart from the noteworthy pixel (Noting Fig. 2, errors obtained at a current pixel

p distributed to adjacent pixels d1-d4 a predetermined distance away. Subsequently, the multilevel values of each adjacent pixel d1-d4 are determined, based in part on the error distributed from the current pixel p). A simple threshold method is used in said converting in step (b) (column 6, lines 46-63).

Regarding claims 8 and 9, the method further comprises the step (c) of diffusing a possible error, which has occurred in binary value with respect to the noteworthy pixel, to multilevel pixels adjacent to the noteworthy pixel by a technique, wherein a possible error, which has occurred in binary value with respect to the noteworthy pixel, is diffused to the pixels based on which the estimated value of the noteworthy pixel is calculated in step (a) (column 7, line 67 – column 8, line 18).

Regarding claims 10 and 11, the method further comprises the step (d) of changing the technique of said error diffusing to another technique in accordance with a predetermined manner as the scanning of the pixels of the multilevel input image progresses (Error diffusion technique is effectively changed by application of pseudo-random weights for propagating error values (column 7, lines 32-59)).

Regarding claims 16 and 17, in said technique changing step (d), the error diffusion technique is changed for every pixel of the multilevel input image (Application of pseudo-random weights (column 7, lines 32-59) results in random error values propagated for each pixel, which demonstrates a change in error diffusion technique for each pixel).

Regarding claims 32 and 33, in said technique changing step (d), the error diffusion technique is changed to another technique that is selected at random from various different error diffusion techniques (column 7, lines 32-59).

Regarding claims 34 and 35, in said error diffusing step (c), the error diffusion technique is a technique of proportionally distributing the occurred error to the plural unscanned pixels adjacent to the noteworthy pixel in accordance with a predetermined weighting pattern (column 7, line 67 – column 8, line 18), and in said technique changing step (d), the error diffusion technique is changed by changing said predetermined weighting pattern to another pattern (column 7, lines 32-59).

Claim 40 is an apparatus claim corresponding to above-rejection method claim 1. The means for performing the method steps of claim 1 are disclosed in Bowers et al., as mentioned above.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1-6, 8-13, 20-27 and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,757,517 (Couwenhoven et al.).

Regarding claims 1-6, Couwenhoven et al. disclose a halftoning method of converting a multilevel input image, comprising the steps of: (a) calculating the multilevel value of a given noteworthy pixel of the multilevel input image, as an estimated value of the noteworthy pixel, based on the multilevel values of pixels other than the noteworthy pixel (column 5, line 46 to column 6, line 17; column 6, line 43 –

column 7, line 11); and converting the estimated multilevel value of the noteworthy pixel (column 7, lines 12-17). In said calculating step (a), the estimated value of the noteworthy pixel is calculated based on the multilevel values of pixels in a predetermined area that is a predetermined distance apart from the noteworthy pixel (column 5, lines 48 and 49, lines 53-65); the estimated value of the noteworthy pixel is calculated using a two-dimensional digital filter for the multilevel pixels in the predetermined area, said digital filter being a two-dimensional digital Prewitt filter dedicated to profile enhancement (column 5, lines 50-53).

The method disclosed in Couwenhoven et al. is not explicitly disclosed as converting the estimated multilevel value of the noteworthy pixel into a binary value, or said two-dimensional digital filter being a Laplacian filter. However, it is well known in the art that error diffusion methods are conventionally performed so as to convert multilevel input image data to image data of one of two levels according to the printing or display capabilities of an output device (column 1, lines 32-42). As many, if not most, printers print in one of two levels, it would have been obvious for one of ordinary skill in the art to apply the error diffusion method disclosed in Couwenhoven et al. to a binary printer so as to remove artifacts that appear in an output image as a result of conventional error diffusion methods (column 3, lines 3-52). Regarding the use of a Laplacian filter, it is stated at column 5, lines 50-53 that activity detector 80 may take the form of an edge detection filter, and two examples are given (Sobel and Prewitt). The Laplacian filter is a well-known filter used in detecting edges in image data, and in view

of the statement by Couwenhoven et al. it would have been obvious for one of ordinary skill in the art to use a Laplacian filter as an alternative to the Sobel or Prewitt filters.

Regarding claim 38, the apparatus claim corresponds to above-rejected method claim 1. The components of the apparatus claim are either disclosed in, or would have been obvious in view of, Couwenhoven et al. for the reasons set forth above.

Regarding claim 39, Couwenhoven et al. do not explicitly disclose a computer-reading recording medium for instructing a computer to perform the method steps of above-rejected claim 1. However, it is well known in the art to provide a recording medium with programming code for instructing a computer to perform processing steps in general, so that the steps may be performed in a computer without the need for specific separate hardware for performing each of the steps, and thus providing computer-reading recording medium for use by a computer would have been obvious to one of ordinary skill in the art.

Regarding claims 8-13, Couwenhoven et al. further disclose the step (c) of diffusing a possible error, which has occurred with respect to the noteworthy pixel, to multilevel pixels adjacent to the noteworthy pixel by a technique, wherein a possible error, which has occurred in binary value with respect to the noteworthy pixel, is diffused to the pixels based on which the estimated value of the noteworthy pixel is calculated in step (a) (column 6, lines 43-62; column 7, lines 18-34). The method further comprises the step (d) of changing the technique of said error diffusing to another technique in accordance with a predetermined manner as the scanning of the pixels of the multilevel input image progresses and the step (e) of discriminating whether or not the noteworthy

pixel is a pixel constituting part of a profile of the multilevel input image, the error diffusion technique being changed from one to another in said technique changing step (d) if the result of said discrimination is positive (column 6, lines 18-35).

Regarding claims 20-27, in the method disclosed in Couwenhoven et al., said profile discrimination is carried put by calculating a profile value of the noteworthy pixel based on both the multilevel value of the noteworthy pixel and those of the adjacent pixels and then comparing the calculated profile value with a predetermined value (column 6, lines 18-27). A two-dimensional digital Prewitt filter dedicated to profile enhancement is used in said calculating of the profile value (column 5, lines 50-53). As mentioned above, the Laplacian filter is a well-known filter used in detecting edges in image data, and in view of the statement by Couwenhoven et al. it would have been obvious for one of ordinary skill in the art to use a Laplacian filter as an alternative to the Sobel or Prewitt filters.

Regarding claims 36 and 37, Couwenhoven et al. do not explicitly disclose carrying out said discrimination for only one of plural multilevel images, and using the result of said discrimination in halftoning remaining multilevel input images having substantially identical profile. However, it is rather obvious for one of ordinary skill to process all identical images in like manner, and that carrying out separate discriminations on images having identical profile would be much more time consuming that need be, given that the results of the discrimination has been obtained for the first image. Thus, it would have been obvious for one of ordinary skill in the art to carry out a discrimination only once for plural multilevel images having identical profile.

Claim 40 is an apparatus claim corresponding to above-rejection method claim 1. The means for performing the method steps of claim 1 are suggested in Couwenhoven et al., as mentioned above.

Allowable Subject Matter

6. Claims 14, 15, 18, 19 and 28-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: No prior art has been found to disclose or suggest "the step (f) of detecting the direction in which the profile of the multilevel input image extends with respect to the noteworthy pixel, values according to the occurred error being added to the values of unscanned pixels along the detected direction of the profile as an exceptional process, in said error diffusing step (c) if the result of said discriminating is positive in step (e)," as recited in claims 14, 15, 18 and 19; or a halftoning method "wherein the profile value is directly calculated by making addition and subtraction individually on the multilevel values of the noteworthy pixel and the adjacent pixels," as recited in claims 28 and 29; or a halftoning method "wherein in said technique changing step (d), the error diffusion technique is changed to another technique that is selected in a predetermined order from various different error diffusion techniques," as recited in claims 30 and 31.

Response to Arguments

8. Applicant's arguments filed in response to the prior rejection of claims 1, 2, 7-11, 16, 17 and 32-35 under 35 U.S.C. §102(b) (section IV of applicant's remarks, at pages

11 and 12 of applicant's amendment) have been fully considered but they are not persuasive.

Applicant asserts that Bowers et al. do not suggest "calculating the multilevel value of a given noteworthy pixel of the multilevel input image, as an estimated value of the noteworthy pixel, based on the multilevel values of pixels other than the noteworthy pixel," stating that Bowers randomly selects values between upper and lower limits of a range to provide digital halftone images, and then assigns an arbitrary number for a magnitude of the detected gray-scale value of the pixel to determine an error value thereof and successively executes an error diffusion process.

Applicant's argument is not persuasive. The calculating step, as broadly recited, reads on a conventional error diffusion process, wherein error values based on a comparison between multilevel and determined binary values of previously-processed pixels are added to a multilevel value of a current pixel, prior to processing the current pixel to determined its binary value. As set forth in the prior Office action and repeated above, Bowers et al. disclose an error diffusion process, wherein gray levels to be quantized are based on a weighted quantization error, which is obtained from previously quantized pixels (column 7, line 67 – column 8, line 18). Errors are based on comparison of prior multilevel pixels and a threshold value, and thus the estimated value of noteworthy pixel is based, at least indirectly, on multilevel values of prior pixels.

9. Applicant's arguments filed in response to the prior rejection of claims 1-6, 8-13, 20-27 and 36-39 under 35 U.S.C. §103(a) (section V of applicant's remarks, at pages

12 and 13 of applicant's amendment) have been fully considered but they are not persuasive.

Applicant asserts that Couwenhoven et al. do not teach or suggest "calculating the multilevel value of the noteworthy pixel based on the multilevel values of pixels other than the noteworthy pixel," stating that in Couwenhoven, a set of activity weights from an image activity signal is computed, and a filtered input value is provided for a digitized continuous-tone input pixel for computing a filtered output value for each possible output level.

Applicant's argument is not persuasive. In Couwenhoven et al. (column 6, line 43 – column 7, line 11), an error signal is generated, based at least indirectly on previously-processed pixels, and the error signal is added to a current weighted input signal. This feature is equivalent to applicant's calculating step, as broadly recited in the claims.

On July 21, 2005, Paul Kravetz (Registration No. 35,230) and Temnit Afework, in a telephone interview on July 21, 2005, reiterated that the calculating step was not disclosed in the cited prior art. The examiner asserted that the broad claims read on any error diffusion process, but would reconsider the rejection. Upon such reconsideration, it is determined that both Bowers et al. and Couwenhoven et al. disclose error diffusion processes that include a calculating step, which applicant's calculating step does not distinguish over, as set forth above.

10. Applicant's arguments filed regarding new claim 40 (section VI, at page 13 of applicant's amendment) have been fully considered but they are not persuasive. Claim

40 is not patentably distinguishable over either Bowers et al. or Couwenhoven et al., for the reasons set forth above with respect to claim 1.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas D. Lee whose telephone number is (571) 272-7436. The examiner can normally be reached on Monday-Friday (7:30-5:00), alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571) 272-7437. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thomas D. Lee
Primary Examiner
Art Unit 2624

tdl
July 21, 2005